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ABSTRACT

Researchers have long focused upon the problems of student/adolescent drug use: however, such a limited perspective may actually provide inaccurate information as to the actual nature and extent of total drug use. It may be more appropriate to emphasize a lifespan developmental perspective regarding drug abuse behaviors, insofar as drug use must be analyzed on a continuum during the lifetime of the individual, rather than as an isolated experience during a particular period of development. Analyzing drug abuse behaviors from such a developmental perspective includes six periods of development: the fetal period, infancy, childhood, adolescence, adulthood, and old age. Based upon joint considerations of developmental psychopharmacology and the biological boundaries of learning, an hypothesis of "developmental dependencies" may account for some of the interactions between drug abuse and the continually developing organism. (Author)

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DEVELOPMENTAL DEPENDENCIES

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TABLE OF CONTENTS

Abstract.....1

Introduction.....2

Fetal Period.....4

Infancy.....6

Childhood.....6

Adolescence.....8

Adulthood.....10

Old Age.....12

Developmental Dependencies.....14

References.....23

Much of our current knowledge in the area of drug abuse is based upon survey data of drug use (and abuse) among various student populations. While it is certainly true that students represent a sizeable proportion of drug users, and abusers, it is important to keep in mind that students are not the only individuals who use drugs; they are just the most easily surveyed. Since students are often assessed as a captive audience, it is relatively simple for a researcher to survey large numbers of them, thus contributing to some of the misleading conclusions about the "drug problem" among adolescents. Unfortunately, it is seldom acknowledged that students are not the only group of individuals who use drugs; consequently, an exclusive emphasis upon student drug use, with a corresponding lack of emphasis upon other age groups, may provide empirically inaccurate information as to the actual nature and extent of total drug use, as well as serious misunderstandings regarding the effective prevention and treatment of drug abuse behaviors (Hochhauser, 1979, in press).

Many experiments have been performed in an attempt to evaluate drug effects upon various human abilities and skills: however, most of these studies have not seriously approached the issue of subject variability. In an effort to analyze some of the almost insurmountable problems encountered when performing drug research upon human subjects, most experimenters have severely limited their subject samples to college students, volunteers, etc. As a consequence, virtually all of the existing experimental drug abuse research has been performed on essentially adult individuals, as ethical and legal restrictions effective preclude the use of minors as experimental participants. Thus, the bulk of the current drug abuse literature documents the physical and psychological effects of drugs upon adult populations, and

although drugs are extensively investigated upon such adults, they are often used by children (Milman, 1972) and adolescents (Peterson, Beer, & Elifson, 1975). As an example, a recent text (Mendelson, Rossi, & Meyer, 1974) thoroughly assessed the various physiological and psychological effects of marijuana upon human subjects--all of whom were males beyond the age of twenty. Obviously, our current knowledge of licit and illicit drug effects may be effectively limited to adult subjects; consequently, the generalizability of such findings may be severely restricted.

Simply because a particular behavior is not assessed by a survey does not mean that the behavior does not exist. Therefore, rather than selectively (and exclusively) emphasizing drug abuse problems among adolescents, it is more appropriate to emphasize a life-span developmental perspective regarding such behaviors. Such a perspective demands that drug use, and abuse, be analyzed on a continuum during the lifetime of the individual, rather than as an isolated experience during a particular period of development. Once this approach is recognized, future investigations will emphasize the relationship of drugs to the level of physiological and psychological maturation achieved by the individual, insofar as drugs will exert quite different effects depending on the developmental processes within the individual (Young, 1967).

In analyzing drug abuse behaviors from such a developmental perspective, six developmental periods will be considered: the fetal period, infancy, childhood, adolescence, adulthood, and old age. Finally, an hypothesis of "developmental dependencies" will be offered to account for some of the interactions between drug abuse and the continually developing organism.

I. THE FETAL PERIOD:

The gestation period is a critical time for neurological development, inosfar as drugs absorbed by the fetus from the mother may be expected to produce relatively long term, perhaps permanent and irreversible physiological and psychological changes. This is obviously not a period in which the individual fetus is likely to use drugs voluntarily; nonetheless, it is acknowledged to be a period of supreme sensitivity to drugs. As summarized by Timiras (1974):

> Additionally, it must be recognized that at no other time during the lifespan can drugs wxert such dramatic effects as during development; indeed, the administration of drugs at selected or critical periods in brain maturation, whether prenatally, neonatally, or at puberty, is capable not only of immediately modifying the functional state of the brain but also of altering the normal timetable of development. In the latter case, irreversible deficits may be incurred that are only manifested at later ages when the respective functions affected reach maturity (p. 417)

Consequently, any amount of licit or illicit drug use by the prospective mother (or father, perhaps) must be carefully monitored, insofar as such use might significantly affect the future development of the fetus. For example, the developing fetus is particularly sensitive to drugs, due to a relatively undeveloped blood-brain barrier, incomplete hepatic functioning, limited excretion ability, etc. Taken together, these factors will severely limit the ability of the fetus to successfully metabolize and excrete drugs. consequently, although numerous drugs (e.g., anticonvulsants, tricyclic antidepressants, lithium carbonate, pedophyllum resin, rubella vaccine, aspirin, etc.) have been linked to various physical deformities (Silverman, 1974),

much less is known about what might appropriately be termed "psychological deformities".

Very often, it is visually apparent if a newborn infant is suffering from a physical deformity; the infant's physiological development need only be observed to determine whether it is similar, or dissimilar, to that of a normally developed child. In a significant number of cases, the early diagnosis of physical birth defects can result in the initiation of effective treatment strategies, so as to minimize the likelihood of future physical debilitation. Psychological deformities, however, are not so easily observed. There is virtually no immediate or reliable method of determining whether an infant has, or does not have, normal psychological development. Typically, such psychometric diagnoses may not be accurately performed for months, or perhaps years after birth, thus making early diagnosis and treatment a practical impossibility. Although there is an increasing amount of empirical evidence dealing with the teratogenic and chromosomal damaging effects of licit (and some illicit) drugs (Weise, 1973), there is virtually no evidence documenting psychological damage as a consequence of drug use during the gestation period.

Regarding the effects of specific drugs during the gestation period, much recent evidence suggests that the developing fetus is particularly sensitive to alcohol, and alcohol use during pregnancy has been implicated in several serious behavioral problems. Several studies have linked chronic alcohol use by the mother during pregnancy to an increased probability of childhood hyperactivity (Cantwell, 1975): presumably the ingestion of alcohol during the gestation period may substantially modify the normal development and function of the brain, resulting in behavioral dysfunctions at a later

age. Moreover, chronic alcohol use during pregnancy has resulted in a "fetal alcohol syndrome" among the offspring of alcoholic mothers (Warner & Rosett, 1975): among the symptoms are reduced growth, physical handicaps, impaired intellectual ability, etc. Clearly, chronic drug use during the pregnancy period may promote serious physical and psychological consequences in the developing fetus.

II. INFANCY:

As with the gestation period, the ingestion of drugs during infancy will be primarily involuntary, although the problem of voluntary accidental poisoning is a serious one. For example, S.J. Cohen (1976) reports numerous cases of accidental methadone poisonings in infants, some as young as seven months of age.

In most cases, medical personnel, as well as parents, are concerned with the life-threatening consequences of an accidental poisoning, and while this is not meant to minimize the seriousness of such physical effects, it must be noted that very little attention has been directed to the possible behavioral consequences of a psychoactive drug overdose. Such psychological effects might be critical, insofar as the accidental ingestion of psychoactive drugs during infancy could promote significant changes upon the still developing nervous system of the infant, although no evidence is available on this topic.

III. CHILDHOOD:

While it is generally acknowledged that substance abuse begins at some indeterminate point during the period of adolescence, there is an increasing amount of survey data documenting the expanding use and abuse of drugs by

children under the age of twelve. Early research from the 1960's in the area of childhood drug abuse suggested that drug use in children was primarily restricted to glue and other types of inhalants (Glaser & Massengale, 1962). However, more recent evidence indicates that the phenomenon of multiple drug use is not entirely unknown in childhood, although glue is still widely used by some individuals (Walter, Maslyn & Shaffer, 1976). Milman (1972) documents two cases of multiple drug (i.e., polydrug) use in ten year old girls, who admitted using glue, carbona, marijuana, LSD, alcohol, intravenous drug administration, and an unknown pill.

In a recent review of drug use, misuse and abuse incidents among elementary school children, S.J. Cohen (1976) reports on a wide variety of different drug use patterns among these youthful students: these patterns include the stealing of drugs from the family medicine cabinet, the use of barbiturates, and observations of alcoholism among nine and twelve year old students. As reported by Cohen, one survey indicated that drug use in children began as early as age nine in some cases. The use and abuse of licit and illicit substances by young children is not an isolated phenomenon; additional evidence (Arnhalt & Klein, 1976) notes the use of drugs among junior high school students.

Unfortunately, much of this information regarding drug use during the developmental period of childhood is based upon anecdotal reports and individual case studies, with little effort being made to systematically investigage the actual extent of drug use among children. Nevertheless, these methodological limitations notwithstanding, it is evident that some drug abuse does begin during child-ood, and researchers can only speculate as to the possible long term physiological and psychological consequnces of such use. For example, might it not be possible that the steadily decreasing

S.A.T. scores of the past decade, as well as the general decline in students' academic abilities, could be due, in part, to the effects of licit and illicit drugs upon the developing cognitive processes (e.g., learning, memory, abstract thinking, etc.) of this period (Hochhauser, 1978)?

IV. ADOLESCENCE:

Adolescent drug use is probably one of the most widely investigated phenomena in the entire area of drug abuse research. While literally hundreds of surveys have been administered to thousands of high school and college students, it is still virtually impossible to provide a comprehensive description of the overall national patterns of adolescent drug use. Due to fluctuating drug prices, continual changes in the availability of a particular drug, peer pressure, etc., most drug use surveys become obsolete shortly after completion. Therefore, while it is practically impossible to provide specific and accurate data on drug use patterns, several general trends appear to have developed over the past few years which merit research research consideration.

First, there appears to be a continual increase in the number of adolescents who use marijuana (Marijuana and Health, 1975): indeed, among some select groups it appears to be more popular than alcohol or tobacco.

Second, there is increasing evidence for a polydrug phenomenon, i.e., the use of drugs in combination (Kamali & Steer, 1976; Hochhauser, 1977), especially the combined use of alcohol and marijuana.

Third, there is epidemiological data suggesting that the use of such licit and illicit substances is beginning at earlier ages; whereas drug use was typically observed among high school and college students, it has now

filtered down to elementary and junior high school students, in some areas (Marijuana and Health, 1975).

Our information and understanding of the effects of such drug use during adolescence is severely limited, in part because the typical adolescent is undergoing significant physiological and psychological changes--changes which might modify the adolescent's response to a particular drug, or combination of drugs. From a physiological maturation perspective, some evidence (Hutt, 1973) indicates that neurons within the ascending reticular activating system (ARAS) do not become completely myelinated until the late teenage years, or early twenties. Moreover, since the ARAS apparently controls such essential psychological functions as awareness, arousal, and selective attention, and has been shown (Ray, 1972) to be especially sensitive to a wide range of drugs (e.g., alcohol, barbiturates, LSD, amphetamines, etc.), it may be that adolescent drug use might temporarily (or permanently) affect the structural and functional maturation of the ARAS.

Hormonal development represents another physical process that might be adversely affected by adolescent drug use, especially the testosterone increase in males and the estrogen increase in females. It should be noted that some highly controversial evidence links chronic marijuana use with decreased testosterone levels in males; unfortunately, such hormonal studies have not yet been performed with female subjects. Any drug that has an effect on hormone levels might also affect development (Leavitt, 1974), emotional states, such as depression (Warburton, 1975), learning and memory, (Broverman, et al, 1974), etc.

To some extent, psychological development parallels physiological development, although precise correlations between physiology and behavior are not possible at the present time (Tanner, 1970). Nevertheless, it is apparent

that the process of psychological development is a continual process, and undergoes significant changes during the adolescent period. Several theories have been proposed to account for these developmental changes: Freud's (1959) theory of psychosexual development, Erikson's (1952) theory of psychosocial development, Piaget's (1952) theory of cognitive development, Kohlberg's (1967) theory of moral development, and Lenneberg's (1969) theory of language development. Although these theories deal with rather disparate behaviors, they all emphasize a relatively orderly progression of behavior from childhood (concrete processes) through adolescence (abstract processes). If human psychological functions proceed in continuous stages from the concrete to the abstract, then there is probably some neurophysiological correspondence to these behavioral progressions. Researchers must investigate the possible consequences of licit and illicut drug consumption upon such proessses, especially as drug use during adolescence might be expected to significantly affect emerging cognitive abilities.

V. ADULTHOOD:

In glaring contrast to the relatively large masses of data that have been collected on drug use and abuse among schcol age and college age students, there is a corresponding lack of information on licit and illicit drug use among adult populations. The reasons for this lack of data are twofold: first, adults are less easily sampled than are students--students represent captive audiences, easily surveyed en masse, whereas adults are less concentrated and less easily surveyed. Second, with the researcher's overemphasis on student drug use, there is an implicit assumption that drugs are simply not used by adults; consequently, there is no need to survey them. However, a sample of 1200 adults in Toronto (Smart & Fejer, 1971) indicated that 28%

of the adults between 20 and 25 years of age had used marijuana, while only 18% of the Toronto high school students surveyed reported the use of marijuana.

Of those relatively few drug use surveys administered to normal adult populations, several consistent trends appaar to have emerged. First, the use of illicit drugs seems to decrease with increasing age: Fisher and Brickman (1973), in a survey of marijuana users, found that non-users tended to be over the age of forty, with most of the current and past users between the ages of twenty one and thirty, while most of the regular and daily users were aged twenty or younger. Congruent with this research was a survey of experienced marijuana smokers (Grupp, 1972) comprised of college students, prison inmates, and ghetto blacks; nearly 75% of the respondents were under twenty one years of age, and most of those reported the use of several drugs.

A survey of San Francisco adults over nineteen years of age (Manheimer, Mellinger, and Balter, 1969) indicated that more males than females used marijuana, whereas more females used amphetamines and tranquilizers than did males. Comparisons of prescription drug use are not easy, since there is evidence that physicians often engage in differential drug prescribing, depending on the sex of the patient (Cooperstock & Sims, 1971; Levine, 1969). A more comprehensive review of the epidemiology of psychoactive drugs and hallucinogenic drug use can be found in Mercer and Smart (1974).

Regrettably, while there is at least a minimal amount of evidence describing the extent of licit and illicit drug use among adult populations, there is a paucity of data dealing with the psychological and physiological changes that may develop during this period. Since it appears that adulthood is a period of relative developmental stability, it might be expected

that drug use during thie period would exert a minimal effect on the individual drug user, since the drugs would be acting on a relatively stabilized nervous system.

VI. OLD AGE:

While most drug abuse researchers recognize the potentially serious problems of drug abuse in youthful populations, there is considerably less recognition of drug problems among the elderly (Heller & Wynne, 1975). Regarding the use and abuse of licit (i.e., prescription drugs), Peterson and Thomas (1975) have found that intentional overdoses of prescription drugs (e.g., Valium, Tuinal, Phenobarbital, Darvon) are often taken by the elderly in an attempt to commit suicide; moreover, such drugs are often taken in combination or with alcohol, highlighting a potentially serious polydrug problem among the elderly. Although there is an increasing awareness of drug use in the elderly (Basen, 1977), there is much less information dealing with the patterns of licit and illicit drug use among this population, especially with respect to motivational variables.

Very little evidence exists dealing with the effects of long term drug addiction among elderly drug users: for example, Capel and Stewart (1971) found that drug addiction could be a significant problem among aging populations. In a survey of 54 addicts over the age of 50 in New Orleans, the average number of years of addiction was thirty six. Obviously, attention must be given to the aging addict, as well as the youthful one.

Acknowledging that licit and illicit drug use is a problem for elderly individuals, future research must be directed to the unique physiological and psychological characteristics of the elderly, insofar as such characteristics may affect the individual's response to drugs (Daniels, 1970). For

instance, as a consequence of the aging process, the older individual may have a reduced metabolic rate, a diminished ability to absorb drugs, as well as a substantial diminution in the excretion processes (Fann, Wheless, & Richman, 1976). Furthermore, the treatment of mental disorders (e.g., senility) in the elderly is often accomplished with psychoactive drugs; unfortunately, the elderly are often more prone to certain drug side effects. Finally, since the elderly individual may be suffering from several physical and psychological problems, the concurrent use of several medications may lead to potentially serious drug interactions (Davis, 1973). Although these problems have been, and continue to be emphasized, a survey of about 90 elderly patients in a variety of settings indicated that there was no reduction by the physician in drug dosage levels as a consequence of the patient's advanced age (Lamy and Kittler, 1971), although such recommendations were made for numerous drugs in the Physician's Desk Reference. As a consequence of the changing physiological patterns that occur with increasing age, as well as the problems of multiple drug usage, inappropriate dosage levels, etc., it may be that some of the behavioral symptoms seen in the elderly are not due exclusively to senility, but to an effective drug overdose, or a particular proneness to drug side effects.

In conjunction with the general decrease in mental functioning that is thought to occur with increasing age (Arenberg, 1976), e.g., deficits in learning, memory, cognitive processes, etc., it may be that the period of old age, a time when both physiological and psychological processes seem to be deteriorating, may be significantly affected by the use of licit or illicit drugs, especially as such drugs may increase the rate of deterioration in the elderly user.

DEVELOPMENTAL DEPENDENCIES: CRITICAL PERIODS IN DRUG ABUSE RESEARCH

In substantiating the necessity for a developmental perspective to drug abuse research, several issues must be resolved. Although some individuals do develop drug problems, not all individuals who are exposed to drugs do so--therefore, one must account for the relatively selective nature of drug abuse. Furthermore, the drugs that are chosen for use often vary with the age of the individual; young people tend to use more hallucinogenic and psychoactive (illicit) drugs than do older people, while the older individual has more of a tendency to use alcohol and prescription drugs. What are the factors that cause an individual to use drug rather than another?

Brink (1977) has suggested that idiosyncratic biochemical abnormalities might be a major factor in the development of alcoholism behaviors; such abnormalities were emphasized in an attempt to account for the fact that only about 10% of those individuals who use alcohol actually develop alcohol problems (Kissin, 1974), and that some individuals appear to develop alcohol problems shortly after their initial drinking experience (Lundberg, 1975). Brink has proposed the term "chemical-dependency-prone body" to explain such inexplicable phenomena. If this biological approach is to become more comprehensive, so as to account for drug abuse behaviors, and not just alcoholism, it follows that critical periods (both physiological and psychological) may exist throughout the lifetime of the individual, providing periods of maximal or minimal sensitivity to the effects of various substances. Thus, it is vital to recognize the potentially viable interactions between biochemical dependence proneness and what is termed "developmental dependence". This analysis argues that drug abuse is not

only a function of the biochemical dependence proneness of the individual drug user, but that the level of physiological and psychological maturation achieved by the drug user will partially determine whether or not drug abuse behaviors are likely to develop.

For example, it has been demonstrated by Nichols (1963) that young rats will acquire a morphine habit faster than older rats, and this data has been interpreted by Lister (1968) as suggesting that the increased activity in the adolescent nervous system might cause young people to be increasingly susceptible to drug effects. Thus, it appears likely that age differences, which certainly reflect differential levels of neural and behavioral maturation, may account for the remarkably increases susceptibility to alcohol and other drugs by specific individuals at critical periods of development. Not only will different drug users respond to the same drug in a variety of ways, but the same individual will probably respond in different ways, depending on the circumstances (e.g., physiological, psychological, social, cultural, etc.). For instance, a summary of the effects of alcohol on the developing fetus (Warner & Rosett, 1975) indicates that the absorption of alcohol by a fetus may result in seriou and relatively permanent physical and behavioral deficits (e.g., the fetal alcohol syndrome), whereas alcohol use during a more mature period would not be expected to cause such debilitating effects. In view of these data, as well as the recent work of Campbell and Randall (1977) which indicated that the effects of amphetamine on rats were a function of the level of maturation of the organism, it is suggested that an individual will experience numerous critical periods, each of which may selectively increase or decrease the probability of physical/psychological depen-

dence on the part of the drug user.

Theoretically related to developmental dependencies are two areas of psychology, one emphasizing the biological boundaries of learning (Seligman, 1970), the other proposing a discipline of developmental psychopharmacology (Young, 1967).

In an attempt to account for some of the differences observed in the relative ease or difficulty in acquiring various behaviors, Seligman (1970) has proposed a tripartite behavioral continuum of preparedness. At one end of this continuum are those behaviors described as prepared--behaviors which are rapidly acquired, with a minimal amount of training, such as instinctive behaviors. The central area of the continuum contains those behaviors described as unprepared--behaviors that can be acquired, but only with a moderate degree of training, such as most forms of classical and operant conditioning. At the other end of the continuum are those behaviors described as contraprepared--behaviors that are virtually unacquirable, regardless of the amount of training, and it is assumed that some organisms may be biologically constructed so as to be unable to acquire certain behaviors.

Seligman's analysis is primarily based on the assumption that <u>different</u> behaviors can be empirically placed on the continuum of preparedness; that is, some behaviors can be viewed as prepared, others as unprepared, and still others as contraprepared. Extending this analysis, it is argued that the <u>same</u> behavior (e.g., addiction) can be placed on the preparedness continuum. Moreover, if it is assumed that a process such as addiction may vary throughout the lifespan of the individual, then it is apparent that such behaviors can be placed on a developmental-preparedness continuum.

Fig. 1 about here

As hypothetically illustrated in Figure 1, an individual may be physiologically/psychologically prepared to acquire an addictive behavior during one period of development, unprepared during another period, and perhaps even contraprepared during another period.

Although speculative at this time, the developmental dependency hypothesis does suggest some possible research strategies to investigate such interactions.

First, it is apparent that longitudinal experiments are critical. For decades, experimenters have been seeking animal models for alcohol and drug problems, with varying degree of success. This hypothesis suggests that one reason for this failure may be that the developmental level of the animal may have been inappropriate for the acquisition of the drug behavior. Lifespan experiments are needed to determine when (and why) a particular drug behavior can, or cannot be acquired.

Second, this hypothesis suggests that there may be critical periods in humans, with respect to the development of drug and alcohol problems. If this is the case, future efforts in research, prevention, treatment, etc. will have to be modified to account for such developmental variations.

Third, this analysis suggests that different categories of drugs (e.g., stimulants, depressants, hallucinogens, etc.) will have different developmental dependencies. Thus, there may be a different function for different drugs; an individual might be prepared to acquire one drug behavior, unprepared for another, etc.

Fourth, there are numerous variables which must be investigated: these

include dosage level, sex differences, etc.

Considering the relationship between drugs, the brain, and behavior, Young (1967) has argued for a recognition of developmental psychopharmacology in an effort to deal with issues arising when one analyzes the effects of chemical intervention during the developmental process(es).

Moreover, an awareness of the significant neurological and behavioral changes that occur as a function of age and experience suggests that an individual will probably encounter a number of developmental dependency periods from conception until death. Such developmental stages have already been proposed by several psychological theorists: these include psychosexual development, cognitive development, moral development, psychosocial development, language development, etc.

Since most drugs can exert powerful effects on cognitive behaviors, social interactions, perceptual abilities, etc., one factor which may influence drug effects will be the developmental level attained by the drug user. So viewed, a comprehensive analysis of drug effects will not be achieved with a relatively limited biochemical dependence evaluation. As one ages chronologically, as well as intellectually, the biochemistry of the brain may undergo significant changes, and unless these continuing changes are identified, and attempts to develop an effective prevention or treatment program will not be entirely successful. Therefore, in order to effectively prevent the development of drug abuse problems, as well as to effectively treat those individuals who have already become dependent upon drugs, researchers must consider the significant interations between drugs and the continually developing organism.

While Figure 1 represents the relative ease of acquiring a drug problem throughout the lifetime, it does not deal with variations in levels of physiological and psychological maturation. Figure 2 represents a general description of changes in level of maturation as a function of chronological age.

Fig. 2 about here

As portrayed in this general inverted U-shaped function, three separate periods of human development are hypothesized. The first, from conception until the late teenage years (or early twenties) represents a period of incremental development. During this period, it is assumed that the basic physiological and psychological processes under development would be most susceptible to drug effects, since the attained level of maturity (or immaturity) will determine the effect of drugs administered during this period.

The central portion of the figure represents a period of stabilized development, extending from the teenage years, or early twenties, until some time in the fifties or sixties. During this period, the processes of physiological and psychological development are virtually complete, and it would be expected that drugs would have less serious consequences than when administered during the period of incremental development, since the drugs would be acting on a mature, rathan than a developing system.

The last period, that of decremental development, possibly occurs sometime during the fifties or sixties and lasts until death. During

this period, the developmental processes begin to deteriorate, and the aging individual may exhibit a particular physiological or psychological responsivity to various drugs, as the deterioration increases. It may well be that the aging individual may exhibit responses similar to the younger individual in the period of incremental development, insofar as the attained level of maturation may be similar. In the case of incremental development, the individual responds in a unique fashion because he is in a relatively immature state; in the case of decremental development, the individual may again be in a state of relative immaturity, insofar as the physiological and behavioral processes are in transition from a period of stabilization to one of immaturity. Viewed in this way, the effects of drugs must be analyzed in relationship to the general levels of maturation achieved by the individual drug user.

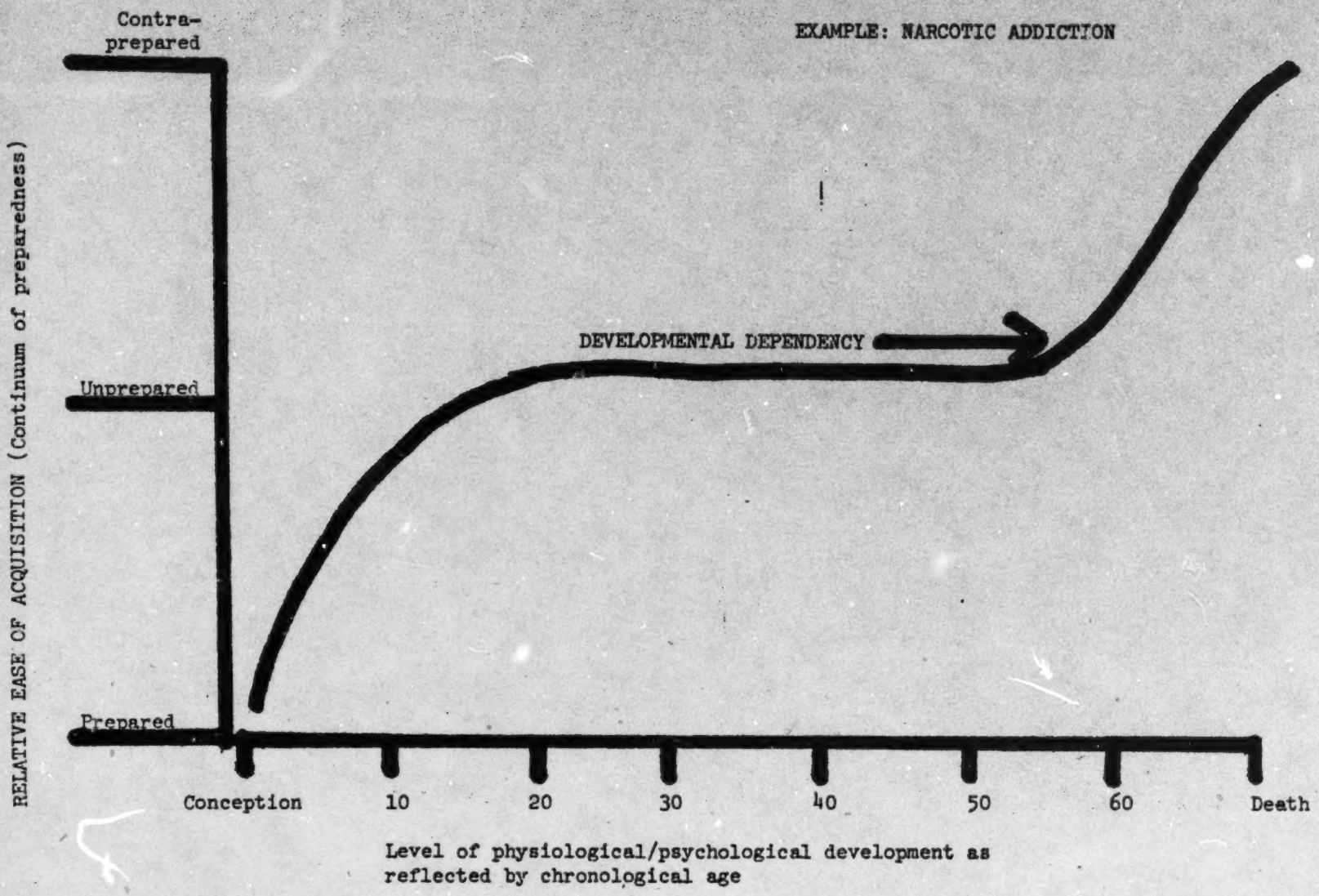

FIG. 1: DEVELOPMENTAL DEPENDENCY: RELATIVE EASE OF ACQUIRING A DRUG BEHAVIOR AS A FUNCTION OF DEVELOPMENT

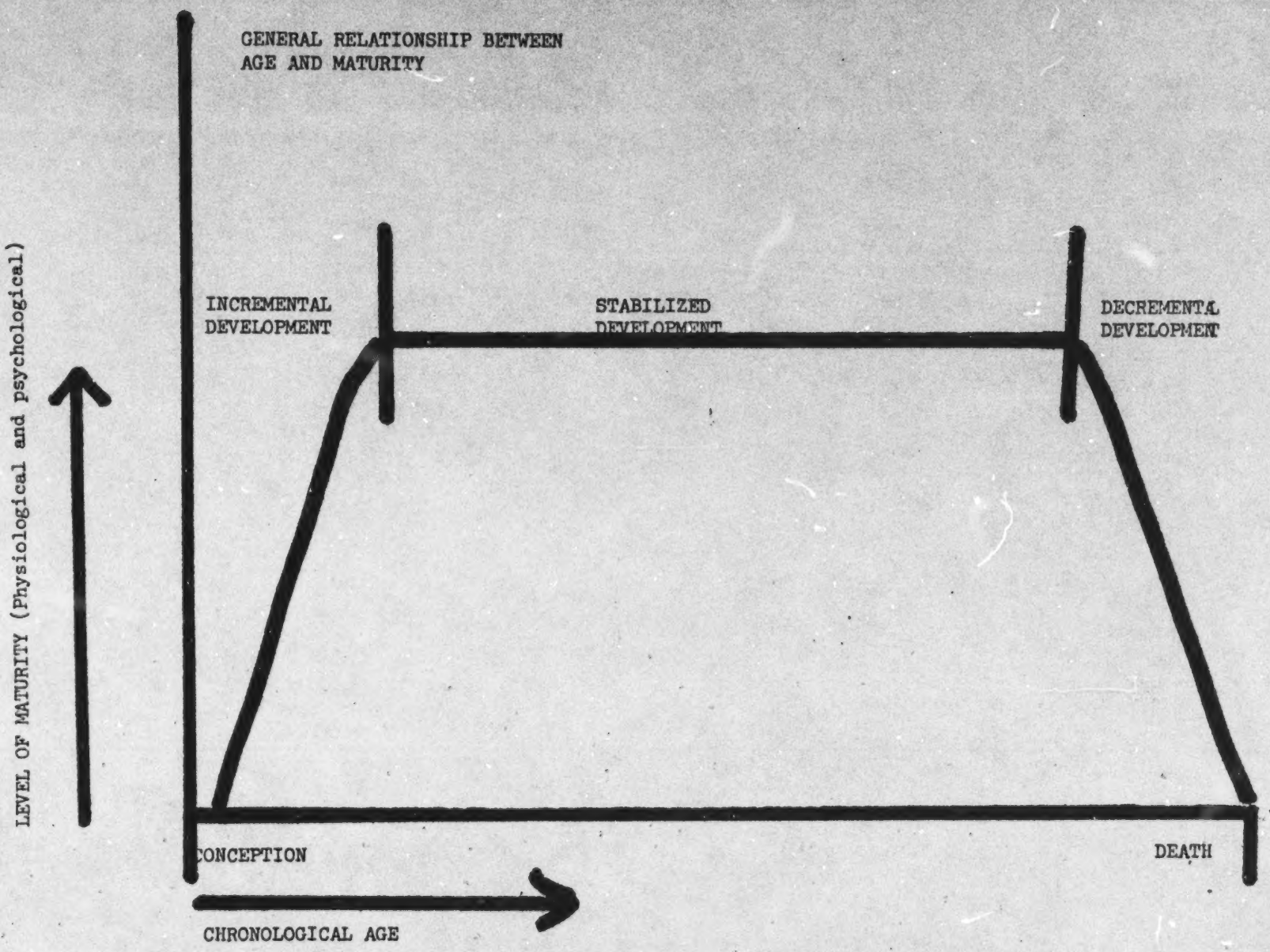

FIG. 2: CHANGES IN GENERAL LEVEL OF MATURATION AS A FUNCTION OF CHRONOLOGICAL AGE

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